

**What is claimed is:**

- 1        1. A circuit system for wireless communications, the
- 2        system transmitting and receiving radio frequency (RF)
- 3        signals via a first and second antenna, comprising:
- 4        a printed circuit board having a predetermined area
- 5        devoid of a solder mask;
- 6        an antenna switch, mounted on the printed circuit board
- 7        within the predetermined area, having at least
- 8        two input ports and at least two output ports,
- 9        enabling connection of any of the input ports to
- 10       either of the output ports, where the output
- 11       ports are coupled to the first and the second
- 12       antennas, respectively;
- 13       a first filter, mounted on the printed circuit board
- 14       within the predetermined area and coupled to one
- 15       of the input ports of the antenna switch,
- 16       blocking unwanted frequency components in an RF
- 17       receive signal from either of the antennas;
- 18       a first matching network transforming the RF receive
- 19       signal from single-ended to differential;
- 20       a converter converting a baseband transmit signal from
- 21       digital to analog;
- 22       a transceiver down-converting the RF receive signal
- 23       supplied by the first matching network to a
- 24       baseband receive signal, and up-converting the
- 25       baseband transmit signal passing through the
- 26       converter to an RF transmit signal;
- 27       a second filter coupled between the converter and the
- 28       transceiver, matching an output impedance of the

29            converter    to    an    input    impedance    of    the  
30            transceiver;  
31        a second matching network transforming the RF transmit  
32            signal from differential to single-ended; and  
33        a power amplifier, mounted on the printed circuit board  
34            within the predetermined area and coupled between  
35            the second matching network and the other input  
36            port of the antenna switch, boosting the RF  
37            transmit signal from the second matching network,  
38            whereby the RF transmit signal undergoing the  
39            boost is transferred to either antenna through  
40            the antenna switch;  
41        wherein the first matching network is coupled between  
42            the first filter and the transceiver, and the  
43            second matching network is coupled between the  
44            transceiver and the power amplifier;  
45        wherein each matching network, having a common node and  
46            a pair of differential nodes, includes a first  
47            capacitor connected between the common node and a  
48            first node of the differential nodes, a first  
49            inductor connected between the first node of the  
50            differential nodes and ground, a second inductor  
51            connected between the common node and a second  
52            node of the differential nodes, a second  
53            capacitor connected between the second node of  
54            the differential nodes and ground, and an  
55            adjustable inductor connected across the  
56            differential nodes and in parallel with the  
57            transceiver.

1        2. The circuit system of claim 1 wherein the  
2 transceiver conforms to the IEEE 802.11a standard, which  
3 down-converts the RF receive signal in a band around a  
4 carrier frequency of 5 GHz to the baseband receive signal  
5 and up-converts the baseband transmit signal to the RF  
6 transmit signal in the band around the carrier frequency of  
7 5 GHz.

1        3. The circuit system of claim 2 wherein the first  
2 filter is a bandpass filter selecting a frequency band  
3 around 5 GHz.

1        4. The circuit system of claim 1 wherein the  
2 transceiver conforms to the IEEE 802.11b standard, which  
3 down-converts the RF receive signal in a band around a  
4 carrier frequency of 2.4 GHz to the baseband receive signal  
5 and up-converts the baseband transmit signal to the RF  
6 transmit signal in the band around the carrier frequency of  
7 2.4 GHz.

1        5. The circuit system of claim 4 wherein the first  
2 filter is a bandpass filter selecting a frequency band  
3 around 2.4 GHz.

1        6. The circuit system of claim 1 wherein the second  
2 filter operating at a baseband frequency has a low pass  
3 filter characteristic.

1        7. The circuit system of claim 1 wherein the printed  
2 circuit board, including four layers of copper and three  
3 layers of FR4 substrate, has a thickness of about 40 mils.

1        8. The circuit system of claim 1 wherein signal  
2 traces, formed on the printed circuit board and coupled  
3 among the antenna switch, the first filter, the power  
4 amplifier, the first and the second matching networks, and  
5 the transceiver, range in width from 15 mils to 18 mils, and  
6 wherein the spacing between the signal traces and a ground  
7 plane is at least 15 mils.

1        9. The circuit system of claim 1 wherein the  
2 transceiver is capable of operating in dual frequency bands  
3 and conforms to both IEEE 802.11a and 802.11b standards.

1        10. A circuit system for wireless communications,  
2 comprising:

3        a printed circuit board having a predetermined area  
4            devoid of a solder mask;  
5        a filter, mounted on the printed circuit board within  
6            the predetermined area, blocking unwanted  
7            frequency components in an RF receive signal;  
8        a first matching network transforming the RF receive  
9            signal from single-ended to differential;  
10       a transceiver down-converting the RF receive signal  
11           supplied by the first matching network to a  
12           baseband receive signal, and up-converting a  
13           baseband transmit signal generated by a baseband  
14           processor to an RF transmit signal;  
15       a second matching network transforming the RF transmit  
16           signal from differential to single-ended; and  
17       a power amplifier, mounted on the printed circuit board  
18           within the predetermined area and coupled to the

19           second matching network, boosting the RF transmit  
20           signal from the second matching network;  
21       wherein the first matching network is coupled between  
22           the first filter and the transceiver, and the  
23           second matching network is coupled between the  
24           transceiver and the power amplifier;  
25       wherein each matching network, having a common node and  
26           a pair of differential nodes, includes a first  
27           capacitor connected between the common node and a  
28           first node of the differential nodes, a first  
29           inductor connected between the first node of the  
30           differential nodes and ground, a second inductor  
31           connected between the common node and a second  
32           node of the differential nodes, a second  
33           capacitor connected between the second node of  
34           the differential nodes and ground, and an  
35           adjustable inductor connected across the  
36           differential nodes and in parallel with the  
37           transceiver.

1       11. The circuit system of claim 10 wherein the  
2       transceiver conforms to the IEEE 802.11a standard, which  
3       down-converts the RF receive signal in a band around a  
4       carrier frequency of 5 GHz to the baseband receive signal  
5       and up-converts the baseband transmit signal to the RF  
6       transmit signal in the band around the carrier frequency of  
7       5 GHz.

1       12. The circuit system of claim 11 wherein the first  
2       filter is a bandpass filter selecting a frequency band  
3       around 5 GHz.

1        13. The circuit system of claim 10 wherein the  
2 transceiver conforms to the IEEE 802.11b standard, which  
3 down-converts the RF receive signal in a band around a  
4 carrier frequency of 2.4 GHz to the baseband receive signal  
5 and up-converts the baseband transmit signal to the RF  
6 transmit signal in the band around the carrier frequency of  
7 2.4 GHz.

1        14. The circuit system of claim 13 wherein the first  
2 filter is a bandpass filter selecting a frequency band  
3 around 2.4 GHz.

1        15. The circuit system of claim 10 wherein the printed  
2 circuit board, including four layers of copper and three  
3 layers of FR4 substrate, has a thickness of about 40 mils.

1        16. The circuit system of claim 10 wherein signal  
2 traces, formed on the printed circuit board and coupled  
3 among the filter, the power amplifier, the first and the  
4 second matching networks, and the transceiver, range in  
5 width from 15 mils to 18 mils, and wherein the spacing  
6 between the signal traces and a ground plane is at least 15  
7 mils.

1        17. The circuit system of claim 10 wherein the  
2 transceiver is capable of operating in dual frequency bands  
3 and conforms to both IEEE 802.11a and 802.11b standards.

1        18. A radio frequency (RF) front-end circuit system  
2 for transmitting and receiving RF signals via a first and  
3 second antenna, comprising:

4 a printed circuit board having a predetermined area  
5 devoid of a solder mask;  
6 an antenna switch, mounted on the printed circuit board  
7 within the predetermined area, having at least  
8 two input ports and at least two output ports,  
9 enabling connection of any of the input ports to  
10 either of the output ports, where the output  
11 ports are coupled to the first and the second  
12 antennas, respectively;  
13 a filter, mounted on the printed circuit board within  
14 the predetermined area and coupled to one of the  
15 input ports of the antenna switch, blocking  
16 unwanted frequency components in an RF receive  
17 signal from either of the antennas; and  
18 a power amplifier, mounted on the printed circuit board  
19 within the predetermined area and coupled to the  
20 other input port of the antenna switch, boosting  
21 a RF transmit signal to be transferred to either  
22 antenna through the antenna switch.

1 19. The RF front-end circuit system of claim 18  
2 wherein the printed circuit board, including four layers of  
3 copper and three layers of FR4 substrate, has a thickness of  
4 about 40 mils.

1 20. The RF front-end circuit system of claim 18  
2 wherein signal traces, formed on the printed circuit board  
3 and coupled among the antenna switch, the filter, and the  
4 power amplifier, range in width from 15 mils to 18 mils, and  
5 wherein the spacing between the signal traces and a ground  
6 plane is at least 15 mils.